CLAIMS

What is claimed is:

1. A drilling fluid circulation system for delivering drilling fluid from a first surface location into a wellbore such that the drilling fluid returns carrying drill cuttings from the wellbore to the first surface location in oil and/or gas well drilling operations, said drilling fluid circulation system comprising:

a drilling unit located at the first surface location above the wellbore for supplying drilling fluid to the wellbore and for receiving drilling fluid and drill cuttings from the wellbore;

a tubular member having an upper end arranged at the first surface location and a lower end extending into the wellbore, said tubular member having a predetermined inner diameter;

a drill tube having an upper end connected to the drilling unit and a lower end extending into the wellbore via the tubular member, said drill tube having a predetermined outer diameter which is smaller than the predetermined inner diameter of the tubular member, said drill tube for carrying drilling fluid from the drilling unit to the wellbore and for defining an annular space between the predetermined outer diameter of the drill tube and the predetermined inner diameter of the tubular member through which the drilling fluid and drill cuttings return from the wellbore to the first surface location, said predetermined outer diameter of the drill tube selected to achieve a predetermined target annular velocity for the drilling fluid returning from the wellbore to the first surface location via the annular space; and

a drilling device connected to the lower end of the drill tube.

2. The drilling fluid circulation system of claim 1, wherein the drilling unit is a land-based drilling unit.

3. The drilling fluid circulation system of claim 2, further comprising a blowout preventer located at the first surface location for preventing a kick from becoming a blowout which creates an out-of-balance well condition.

4. The drilling fluid circulation system of claim 1, wherein the drilling unit is an offshore drilling unit wherein the first surface location is near sea-level and wherein a second surface location is at seabed.

5. The drilling fluid circulation system of claim 4, further comprising a riser having an upper end connected to the offshore drilling unit near the first surface location and a lower end connected to the wellbore at the second surface location, said riser for delivering the returning drilling fluid and drill cuttings to the offshore drilling unit.

6. The drilling fluid circulation system of claim 4, further comprising a blowout preventer located at the second surface location for preventing a kick from becoming a blowout which creates an out-of-balance well condition.

7. The drilling fluid circulation system of claim 1, wherein the target annular velocity of the returning drilling fluid is greater than slip velocity of the drill cuttings and less than the threshold velocity between laminar flow and turbulent flow.

8. The drilling fluid circulation system of claim 1, wherein the target annular velocity of the returning drilling fluid is greater than 100 FPM and less than the threshold velocity between laminar flow and turbulent flow.

9. The drilling fluid circulation system of claim 1, wherein the target annular velocity of the returning drilling fluid is approximately the optimum target annular velocity of 150 FPM.

10. The drilling fluid circulation system of claim 1, wherein the predetermined outer diameter of the drill tube is selected to be between $6\ ^{3}/_{4}$ inches and $9\ ^{7}/_{8}$ inches and wherein the predetermined inner diameter of the tubular member is between 12 inches and 18 inches.

11. The drilling fluid circulation system of claim 1, wherein the tubular member is a surface casing and the drill tube is a string of drill pipes.

12. The drilling fluid circulation system of claim 1, wherein the drilling process is at an overbalanced state.

13. The drilling fluid circulation system of claim 1, wherein the drilling process is at a near-balanced state.

14. The drilling fluid circulation system of claim 1, wherein the drilling process is at an underbalanced state.

15. A system for delivering drilling fluid from a first surface location into a wellbore such that the drilling fluid returns carrying drilling fluid and drill cuttings from the wellbore to the first surface location, said system comprising:

a tubular member having an upper end arranged at the first surface location and a lower end extending into the wellbore, said tubular member having a predetermined inner diameter between 12 inches and 18 inches; and

a drill tube having an upper end located at the first surface location and a lower end extending into the wellbore and through the tubular member, said drill tube having a predetermined outer diameter between between $6\ ^{3}/_{4}$ inches and $9\ ^{7}/_{8}$ inches, said drill tube for carrying drilling fluid from the first surface location to the wellbore and for defining an annular space between the drill tube and the tubular member through which the drilling fluid and drill cuttings return from the wellbore to the first surface location, said predetermined outer diameter of the drill tube selected to achieve a target annular velocity for the drilling fluid returning from the wellbore to the first surface location via the annular space, said target annular velocity being greater than 100 FPM and less than the threshold velocity between laminar flow and turbulent flow.

16. The system for delivering drilling fluid of claim 15, wherein the first surface location is located on land.

17. The system for delivering drilling fluid of claim 16, further comprising a blowout preventer located at the first surface location for preventing a kick from becoming a blowout which creates an out-of-balance well condition.

18. The system for delivering drilling fluid of claim 15, wherein the first surface location is located near sea-level and wherein a second surface location is located at seabed.

19. The system for delivering drilling fluid of claim 18, further comprising a riser having an upper end located at the first surface location and a lower end connected to the wellbore at the second surface location, said riser for delivering the returning drilling fluid and drill cuttings to the first surface location.

20. The system for delivering drilling fluid of claim 18, further comprising a blowout preventer located at the second surface location for preventing a kick from becoming a blowout which creates an out-of-balance well condition.

21. The system for delivering drilling fluid of claim 15, wherein the target annular velocity of the returning drilling fluid is approximately the optimum target annular velocity of 150 FPM.

22. The system for delivering drilling fluid of claim 15, wherein the tubular member is a surface casing and the drill tube is a string of drill pipes.

23. The drilling fluid circulation system of claim 15, wherein the drilling process is at an overbalanced state.

24. The drilling fluid circulation system of claim 15, wherein the drilling process is at a near-balanced state.

25. The drilling fluid circulation system of claim 15, wherein the drilling process is at an underbalanced state.

26. A drilling fluid circulation system for delivering drilling fluid from a first surface location into a wellbore such that the drilling fluid returns carrying drill cuttings from the wellbore to the first surface location in oil and/or gas well drilling operations, said drilling fluid circulation system comprising:

an offshore drilling unit located at the first surface location, said first surface location is at sea-level, said offshore drilling unit for supplying drilling fluid to the wellbore and for receiving drilling fluid and drill cuttings from the wellbore;

a tubular member having an upper end arranged at the first surface location and a lower end extending into the wellbore, said tubular member having a predetermined inner diameter;

a drill tube having an upper end connected to the drilling unit and a lower end extending into the wellbore via the tubular member, said drill tube having a predetermined outer diameter which is smaller than the predetermined inner diameter of the tubular member, said drill tube for carrying drilling fluid from the drilling unit to the wellbore and for defining an annular space between the predetermined outer diameter of the drill tube and the predetermined inner diameter of the tubular member through which the drilling fluid and drill cuttings return from the wellbore to the first surface location, said predetermined outer diameter of the drill tube selected to achieve a predetermined target annular velocity for the drilling fluid returning from the wellbore to the first surface location via the annular space; said target annular velocity being greater than slip velocity of the drill cuttings and less than the threshold velocity between laminar flow and turbulent flow.

a drilling device connected to the lower end of the drill tube; and

a riser having an upper end connected to the offshore drilling unit near the first surface location and a lower end connected to the wellbore at a second surface location, said riser for delivering the returning drilling fluid and drill cuttings to the offshore drilling unit, said second surface location is at sea-bed.

27. The system for delivering drilling fluid of claim 26, further comprising a blowout preventer located at the second surface location for preventing a kick from becoming a blowout which creates an out-of-balance well condition.

28. The drilling fluid circulation system of claim 26, wherein the predetermined outer diameter of the drill tube is selected to be between 6 $^{3}/_{4}$ inches and 9 $^{7}/_{8}$ inches and wherein the predetermined inner diameter of the tubular member is between 12 inches and 18 inches.

29. The drilling fluid circulation system of claim 26, wherein the tubular member is a surface casing and the drill tube is a string of drill pipes.

30. The drilling fluid circulation system of claim 26, wherein the drilling process is at an overbalanced state.

31. The drilling fluid circulation system of claim 26, wherein the drilling process is at a near-balanced state.

32. The drilling fluid circulation system of claim 26, wherein the drilling process is at an underbalanced state.